## REMARKS

Claims 1, 2, 4, and 6-18 are pending in the present application, claim 18 having been added and claim 5 having been cancelled herein. The Office Action and cited references have been considered. Favorable reconsideration is respectfully requested.

In the amended Claims 1 and 16 (now independent), Applicants claim the use of measuring chirp for detecting non-linearity effects in an optical communication section by comparing the measured chirp value with a chirp value related to the optical section/path when in its linear condition, and for making a traffic management decision in the optical network which comprises that path or section, based on detecting the non-linear condition of the section.

The literal support for the term "detection" can be found on page 2, lines 17-19 in the original description. The feature of comparing the measured chirp with the chirp value of the same section in linear condition is supported by the description on page 9 line 30 – page 10 line 16 and Figs 1b, 1c. The traffic management decisions are generalized and formulated so as to distinguish them from the measures like dispersion compensation or regulation of transmitter chirp, described in Kawasaki and Inui. The list of traffic management decisions, which allows applying the generalized network management term, can be found in the original Claim 5, on page 3, lines 21-28. The support for the structural units claimed in the independent claim 16 is found in Figs 3 and 4 and the corresponding detailed description.

Claim 3 (previously cancelled) is now re-introduced as new claim 18. Claim 5 has been cancelled and its limitations have been introduced into the amended Claim 2. Claim 17 has been amended to become a system claim and now depends on Claim 16.

Claims 1-2 and 4-17 were rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the enablement requirement. This rejection is respectfully traversed.

The Examiner has asserted that the specification does not enable one to perform the claimed measurement of chirp. As mentioned above, Applicant has amended claim 1 to recite detecting a condition of non-linearity in a network section corresponding to an optical path extending in a network by measuring chip of an optical signal passing in the network section. The Examiner's attention is invited to page 6, line 14 - page 7, line 23, which discusses the calculation of chirp for the linear condition of a particular optical path, and for non-linear systems. Further, the Examiner's attention is invited to the references submitted in an information disclosure statement filed on even date herewith. These references all teach various techniques for measuring chirp in optical networks. Short portions of abstracts and summaries are provided to show that the references indeed deal with measuring chirp and teach specific methods and tools for performing the measurements.

Applicant respectfully submits that at the time of filing the application, a skilled artisan would be enabled to perform measurement of optical chirp.

1. **Simple Measurement Of Fiber Dispersion And Of Chirp Parameter Of Intensity Modulated Light Emitter. F. Devaux, Y. Sorel And J.F.Kerdiles.** Journal of Lightwave Technology, Vol.11, No.12 December 1993.

**Summary:** "...The method is easy, quick and accurate for chirp parameter in the 10-to-10 range."

2. **Direct Measurement Of Chirped Fundamental And Stimulated Raman Radiation In Fibers.** Gomes, A. S. L. (Imperial Coll, London, Engl); Da Silva, V. L.; Taylor, J. R.

**Source:** Optical Soc of America, 1987, p 82
**Database:** Compendex.

**Summary:** A spectral windowing technique in conjunction with a synchronously operating streak camera was used to characterize the induced chirp on the fundamental and generated first order Stokes simulated Raman scattered radiation...

3. **Variation of frequency chirp with wavelength in an InGaAsP/InP multiple-quantum-well (MQW) waveguide electroabsorption modulator**
M.S. Whalen; T.H. Wood; B.I. Miller; U. Koren; C.A. Burrus; G. Raybon
Photonics Technology Letters, IEEE
Volume: 3 Issue: 5 May 1991
Page(s): 451-452
Digital Object Identifier 10.1109/68.93875

**Summary:** Through measurements of the modulation index and the optical power spectra, the chirp parameter for an InGaAsP quantum-well electroabsorption waveguide modulator has been determined. The result shows that the frequency chirp parameter achieves a minimal value of 0.6 at wavelengths between 1509 and 1545 nm.....

4. **Wideband chirp measurement technique for high bit rate sources. R.A. Sanders, J.P. King, and I. Hardcastle.** IEEE 1994. Electronics Letters Online No:19940917, 20 June 1994.

**Summary:** A Mach Zender (MZ) interferometer has been used as an optical discriminator to measure the time-resolved frequency chirp of an optical source. Fig. 1 illustrates a Chirp measurement testbed.

5. **Time-resolved measurement of dynamic frequency chirp due to electrostriction mechanism in optical fibers**
D. Le Quang; Y. Jaouen; M. Zimmerli; P. Gallion; J.B. Thomine
Photonics Technology Letters, IEEE
Volume: 8 Issue: 3 March 1996
Page(s): 414-416
Digital Object Identifier 10.1109/68.481135

**Summary:** The electrostrictional excitation of acoustic waves by light pulses in optical fibers results in a timing jitter in soliton transmissions which, in turn, imposes a limitation on the transmission rate in long-distance communication systems. We report.. .....dynamic frequency shift measurement in a probe and pulse signal arrangement.

6. **Time-resolved frequency chirp measurement using a silicon-wafer etalon**
S. Tammela; H. Ludvigsen; T. Kajava; M. Kaivola
Photonics Technology Letters, IEEE
Volume: 9 Issue: 4 April 1997
Page(s): 475-477
Digital Object Identifier 10.1109/68.559393

**Summary:** A new method for determination of time-resolved frequency chirp in modulated light sources of optical communication systems is presented. A thin silicon wafer acting as a low-finesse etalon was used as an optical frequency discriminator.

7. http://lib.tkk.fi/Diss/2002/isbn9512259869/isbn9512259869.pdf **- Dispersion measurements of fiber-optic components and applications of a novel tunable filter for optical communications. Tapio Niemi.** Helsinki University of Technology. Department of ECE. June 14, 2002.

**Summary:** Overview of Measurement methods for frequency chirp – Section 4.1

8. **"Device for frequency chirp measurements of optical transmitters in real time" Tapio Niemi et al .**Review of scientific instruments, Vol 73, no.3; March 2002.

**Summary:** A new automated device for measurement of time resolved frequency chirp of optical transmitters. It measures chirp in real time by utilizing two temperature-tunable silicon wafer etalons as frequency discriminators. The time-resolved frequency chirp in a range of + 12 GHz can be measured with a time resolution of approx. 40 ps.can be measured. © 2002 American Institute of Physics.

9. **Chirp Measurement of Multimode Q-Switched Laser Diode Pulses by Use of a Streak Camera and a Grating Monochromator, A. Bresson, N. Stelmakh, J. -M. Lourtioz, A. Shen, and C. Froehly,** Appl. Opt. 37, 1022-1025 (1998)

**Summary**: "...An analytical formula is derived that allows us to relate the chirp amplitude to the inclination of the modal structure in the streak image. Two configurations are proposed for a practical determination of the chirp amplitude in multimode emissions..." © 1998 Optical Society of America

10. **https://www.cerias.purdue.edu/tools_and_resources/bibtex_archive/archive/2000-26.pdf DIRECT SPACE-TO-TIME PULSE SHAPING FOR ULTRAFAST OPTICAL WAVEFORM GENERATION. - Daniel Leaird.** A thesis submitted to the Faculty of Purdue University. December 2000

Section 3.3.1, page 37 – Chirp measurement on the output of a DSP pulse shaper.

11. **http://www.tek.com/Measurement/cgi-bin/framed.pl?Document=/Measurement/Products/press/optical/&FrameSet=optical - Tektronix Makes Strong Push into DWDM Market with Portfolio of Photonics Network Measurement Systems - Q7606 Chirp Test Instrument.**

The Q7606 Chirp Test Instrument provides optical design and manufacturing engineers with a fast and reliable method for measuring chirp in high-speed DWDM and SDH/SONET systems. For optical communications systems that transmit signals up to 10 Gbit/s, the Q7606 Chirp Test Instrument can calculate alpha chirp values in less than 45 seconds as compared to alternative test systems which can take up to 20 minutes for preliminary measurements.

When the Q7606 tester is used with Tektronix' CSA 803C/11801C sampling oscilloscopes and the D3186 pulse-pattern generators, it provides a high performance chirp solution for high-speed optical transmissions.

12. **Fiber Optic Test and Measurement, Derickson, Dennis.** Book, 1998, Prentice Hall, USA .

Section 1.12.5 describes Linewidth and Chirp Measurement. Heterodyne and Homodyne analysis tools are used to examine the fine structure of optical signals.

Applicant respectfully submits that upon reading Applicants' specification as a whole, including this portion and the portion of page 9, lines 26-29, one of ordinary skill in the art would be able to make and use the invention, particularly given the start of the art as discussed above at the time the application was filed. Nothing further is required. If this rejection is maintained, the Examiner is requested to specifically explain why he believes that the claimed feature of measuring chirp is not enabled by Applicants' specification.

Claims 1 and 16 were rejected under 35 U. S. C. §102(b) as being anticipated by Kawasaki (EP 0,944,191). Claims 1 and 16 were rejected under 35 U. S. C. §102(e) as being anticipated by Inui et al. (U.S. Patent No. 6,958,467) with reference to Kawasaki.[1] Claim 14 was rejected under 35 U.S.C. §103 as being unpatentable over Kawasaki. Claim 17 was rejected under 35 U.S.C. §103 as being unpatentable over Kawasaki, in view of Ramaswami. Claims 14-15 were rejected under 35 U.S.C. §103 as being unpatentable over Inui. Claim 17 was rejected under 35 U. S. C. §103 as being unpatentable over Inui and further of Ramaswami. Applicants note with appreciation the indication that claims 2, 4, and 6-13 are allowable over the prior art, in view of the absence of rejection of those claims over any cited art.

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[1] Applicants respectfully submit that this rejection is improper, because to be an anticipation under 35 U.S.C. § 102(e), all of the claimed elements must be found in a single reference. If this rejection is maintained, correction is respectfully requested.

The rejection of claims 1 and 14-17 are traversed to the following reasons. Claim 1 recites a method of traffic management in an optical network, comprising detecting a condition of non-linearity in a network section corresponding to an optical path extending in the network by measuring chirp of an optical signal passing in the network section, comparing a value of the measured chirp with at least one chirp threshold value preliminarily known for the network section when being in its linear condition, and in case the condition of non-linearity is detected in the network section, making a traffic management decision in the optical network for restricting or avoiding use of the network section in the network. This is not taught, disclosed or made obvious by the prior art of record.

Before discussing the merits of the rejections, Applicants will discuss the nature and reasons of non-linear effects in optical networks. Non-linear effects leading to non-linearity of an optical system may be caused, for example, by power values not corresponding to thresholds predetermined for the optical system (see page 1, lines 8-14 of the present application). Applicants have found and demonstrated that, shown in Fig. 1(c), non-linear effects result in a sharp increase of chirping in the system.

Applicants have accordingly proposed a method for detecting a condition of non-linearity in a network section (a path) of an optical network by measuring chirp, comparing that chirp value with a chirp value preliminarily known for the section being in its linear condition, and if the non-linearity is detected, making traffic management decisions in the whole optical network, to reduce damage of that non-linear network section to the traffic in the network.

It should be mentioned that when an optical network section becomes non-linear, it affects optical non-linearly (i.e., non-expectedly) signals carried through the section and thus

cannot be used for traffic in its non-linear condition. Regular dispersion compensation steps are insufficient in such situations, and thus Applicants propose traffic management measures for avoiding/restricting the use of the non-linear section upon detecting the non-linearity. It should be noted that the traffic management decision is taken on the network level, not at the level of the path (its dispersion).

Detection of the approaching condition of non-linearity is highly important for industrial networks, in order to timely prevent any possible damage to the traffic. In the present application, it can be done by selecting a flexible range of chirp thresholds – at least three different thresholds, and by forming a lower bound chirp threshold and an upper bound chirp threshold (Claims 10, 11, 12, 13). Various degrees of accuracy formed by the range of thresholds allow detection of the approaching non-linearity condition.

Kawasaki describes the chirp created by a transmitter (see Kawasaki Fig. 17, and the cited paragraph [0108]). The transmitter's chirp has a nature that is absolutely different from that of the chirp caused by non-linearity of an optical transmission line, discussed in the present application. See abstract and paragraph [0107], which clearly says that Kawasaki deals with adjustment of the chirp parameter of the optical signal to be output from the optical transmitter.

This difference is further confirmed by paragraph [0035] of Kawasaki, which gives a definition of a chirp parameter $\alpha$ of an optical pulse generated at a transmitting end of an optical line (more specifically, by MZ modulator 24 coupled to the transmitter 20) before launching the optical signal to the optical line. It is correct and natural that Kawasaki mentions a second derivative of phase of optical signal, but Kawasaki's optical signal is a signal just generated for transmitting. Kawasaki, in Fig. 2, shows the modulator 24, and paragraph [0031]

describes Kawasaki's method of pre-chirping at the transmitter side of the transmission line for suppressing a degradation in transmission waveform.

Applicants respectfully disagree with the Examiner's note in paragraph 14 of the Action that "the path of the optical signal the transmitter of Kawasaki does constitute an optical path where the optical signal passes," since the optical path the Examiner mentions is actually an abstract mathematical point but not the physical object on which Applicants focus in the present invention and where non-linearity effects of optical lines may develop.

As can be seen, both the nature of the Kawasaki's chirp, and the method of pre-applying such chirp and adjusting the value of applied chirp are absolutely different from, and even opposite to, the method proposed in the present invention (which is detecting the non-linearity of an optical path/section based on the chirp of an optical signal which has already passed through the optical path/section).

Inui describes measuring chirp in an optical line and describes performing dispersion compensation operations in response to the measured chirp. Upon performing the proposed amendment which emphasizes the inventive concept as "detecting non-linearity of an optical line/section based on measuring chirp", the present invention is clearly distinguished from the Inui reference.

Inui describes measurement of chirp of an optical signal, but after that takes care only of adjusting chromatic dispersion in the optical line. As acknowledge by Applicants in the original application, optical communication lines in their linear condition are not free from chirping, that the chirp in such linear systems is mainly the result of chromatic dispersion, and chirp value in the linear system can be predicted and at least partially compensated by Dispersion

Compensation Modules DCM (see Figs. 1a and 1b; see page 9, lines 5-16 of the original description, being the last paragraph of the detailed description to Fig. 1b).

Applicants further refer to Fig. 1c of the original description, which illustrates chirp levels in the optical line in its non-linear condition, and to the description of Fig. 1c (especially page 10, lines 5-16) which discloses detecting a non-linearity level by comparing the measured chirp with a threshold value which is based on calculations of the optical line being in its linear condition.

In contrast, Inui just describes measuring chirp in linear optical transmission lines and adjusting dispersion in such lines. Inui performs no more than the operations known from the prior art; these operations correspond to the disclosure provided by the Applicants with reference to the original Figs 1a and 1b.

Inui does not judge non-linearity of an optical line and does not propose detection thereof. Inui does not propose any criteria for detecting a non-linearity level and deciding which level is still acceptable and which already requires traffic management decisions of restricting/avoiding the use of the specific optical communication section where the chirp was measured.

Further, Kawasaki cannot be combined with the reference of Inui, since the chirp of Kawasaki (being actually the pre-chirping of an optical signal at the transmitter) cannot be "applied" to the system of Inui where the chirp measurement is performed at the receiving end of the optical line.

Both Kawasaki and Inui teach away from the idea of the present invention to detect non-linearity of a real optical section based on changes of the chirp with respect to

preliminarily known chirp values of the section in linear condition, and to make a traffic management decision in the optical network including that section.

Therefore, neither alone nor in combination do the two references allow arriving to the idea of the invention. Neither of the cited references alone or in combination motivate one of ordinary skill to make a logical step that allows understanding that the value of chirp measured in an optical system could serve as a tool for detecting either the already existing or the approaching non-linearity of a network or section thereof, and that upon detecting a specific level of non-linearity one may take traffic management decisions to restrict or avoid the use of such non-linear section.

For at least these reasons, Applicants respectfully submit that claims 1 and 14-17 are patentable over the prior art of record whether taken alone or in combination as proposed in the Office Action.

In view of the above amendment and remarks, Applicants respectfully request reconsideration withdrawal of the outstanding rejections of record. Applicants submit that the application is in condition for allowance and early notice to the effect is most earnestly solicited. If the Examiner has any questions, he is invited to contact the undersigned at 202-628-5197.

Respectfully submitted,

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